

Application Performance Monitoring

Norman Brickman, nfb@mitre.org

Lorraine DeBlasio, lorraine@mitre.org

13 March 2000

**Organization: W035
Project: EC System Engineering**

MITRE

Scope

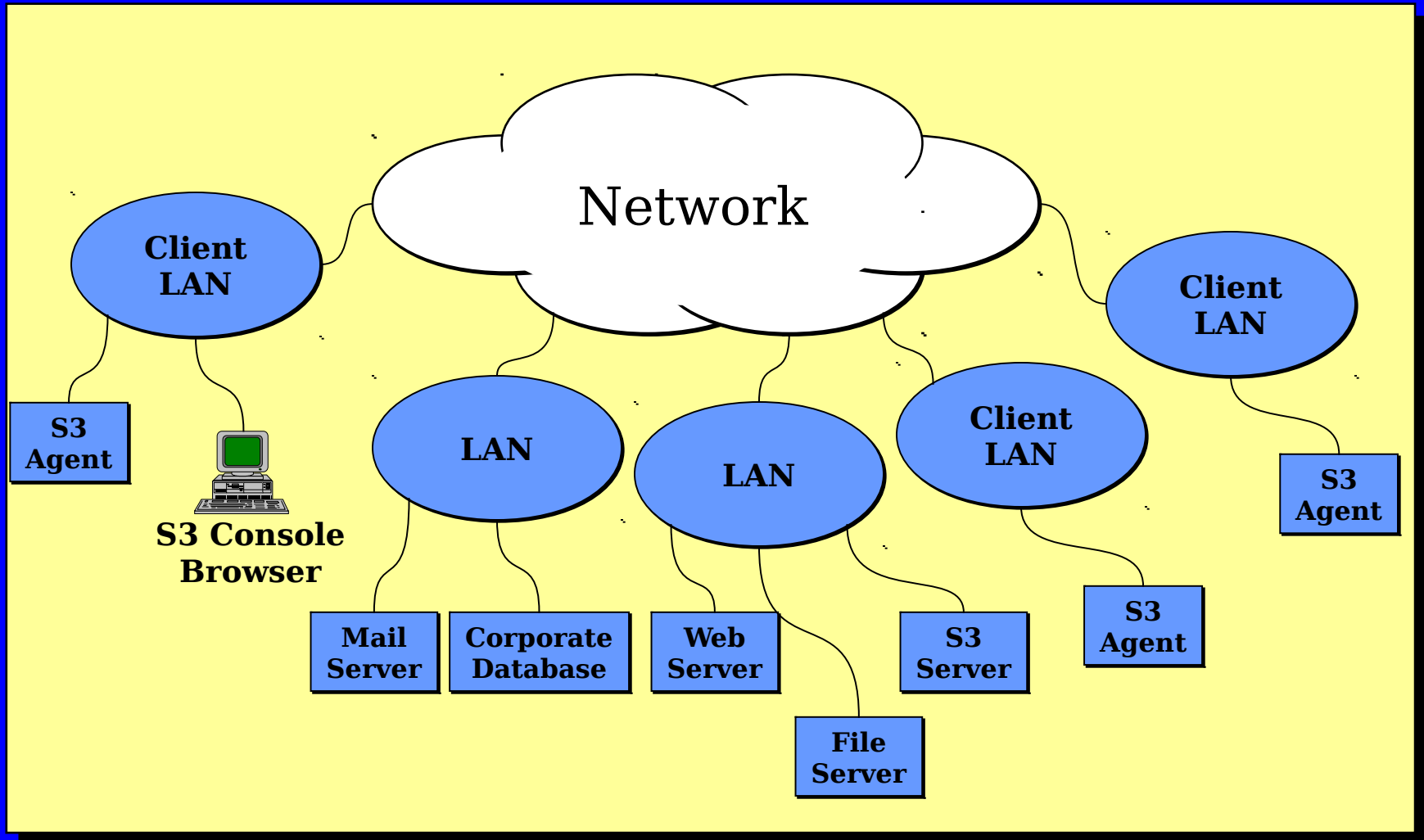
- **Technology briefing**
- **Not COTS tool evaluation**
- **Focus on Application Performance Monitoring
(Electronic Business/Electronic Commerce sites)**
- **Tasking by JECE EMALL team**
- **Recommendations will be deferred to another meeting**

Evaluated Tool

NextPoint S³

- **MITRE not endorsing product**
 - NextPoint is top rated in the literature, *Network Computing*, 7 Feb 2000, 9 Aug 1999
- **Focus of today's briefing is EC capabilities of tool**
 - Synthetic transactions, application and network correlation, service level agreements, trend analysis, predictive analysis
- **Other capabilities include**
 - Real time event tracking; response time monitoring for database queries, TCP socket access, running operating system commands, and DNS; user plug-ins for synthetic transactions; network discovery; status ticker for network objects and interfaces; frame relay network monitoring, and custom collector (MIB variables on SNMP-compliant devices).
 - Also inventory, discovery, RMON, ATM

Agent-Based APM Component Positioning



Monitoring Electronic Commerce Web Sites

- What are the typical user experiences?
- What are useful metrics for EC sites?
 - Web server information does not reflect site performance
- *Synthetic Application Transactions* (capture, then measure user sessions at regular and frequent intervals)
 - Capture typical user sessions
 - Measure response times
 - Reflect end-to-end user perspective

session = series of consecutive and related web pages accessed by a user to perform a business function

Service Levels and Trend Analysis

- **Service Levels**
 - Define desired service levels
 - Track and report on success of meeting service levels
 - DoD EMALL, search on “cordless drill”
- **Predictive analysis (future performance of EC site)**
- **Capacity planning tool in production environment**

Next Steps

- **MITRE conducting quick commercial survey of network and application monitoring tool market**
- **Results of survey available in April 2000**
- **Ongoing testing in MITRE lab**

NextPoint's S³

- - - - -

Sample Screen Shots

CHANNEL - TOPS

NextPoint Networks home page - Microsoft Internet Explorer

File Edit View Go Favorites Help

Back Forward Stop Refresh Home Search Favorites History Channels Fullscreen Mail Print Edit

Address <http://mebs/NextPoint/nphml/index2.html> Links

CHANNEL SETUP

CHANNEL

TOPS

EXCEPTIONS

SERVICE MANAGEMENT

NETWORK

DNS

IP SERVICES

APPLICATIONS

MAP

INVENTORY

PREDICTIVE ANALYST

SUMMARY REPORTS

LINKS

Daily Tops Reports

- Response Time
 - Most recent (11/23/99 Tue.)
 - More...
 - Nov., 1999
 - Oct., 1999
 - 10/31/99 Sun.
 - 10/30/99 Sat.
 - 10/29/99 Fri.
 - 10/28/99 Thu.
 - 10/27/99 Wed.
 - 10/26/99 Tue.
 - 10/25/99 Mon.
 - 10/24/99 Sun.
 - 10/23/99 Sat.

Daily

Weekly

Monthly

Refresh

Generate Report

Print

Export

Help

Network

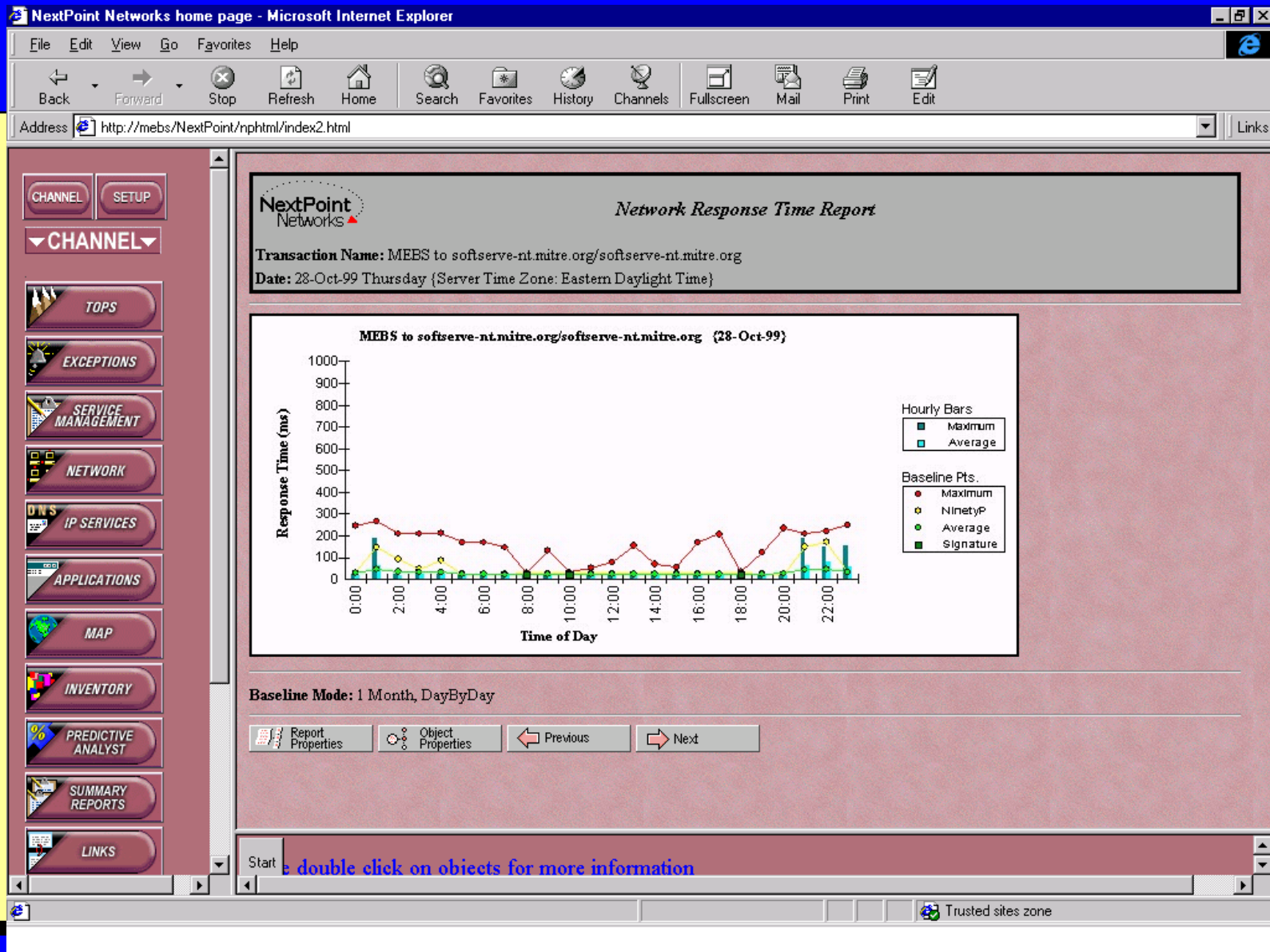
Top Network Delay Report for 10/28/99 Thu.

Rank	Transaction Name	Start Time	End Time	Variance	Value
1	MEBS to rest1gw.mitre.org/128.29.1.5	12 Midnight	1 AM	294.25%	12.25 ms
2	NFB1 to rest1gw.mitre.org/128.29.1.5	12 Midnight	1 AM	183.51%	10.25 ms
3	NFB1 to restgw.mitre.org/128.29.9.254	7 AM	8 AM	179.19%	3.75 ms
4	MEBS to restgw.mitre.org/128.29.1.6	7 AM	8 AM	126.31%	2.5 ms
5	MEBS to CoreBuilder-643AE3/wrests13...	10 PM	11 PM	105.46%	57.25 ms
6	MEBS to bblde1c204-cb3500a.mitre.or...	10 PM	11 PM	88.29%	122.5 ms
7	MEBS to inforsv3.mitre.org/infosrv3.m...	10 PM	11 PM	81.2%	85 ms
8	MEBS to info2.mitre.org/info2.mitre.org	10 PM	11 PM	79.79%	83.75 ms
9	MEBS to softserve-nt.mitre.org/softserv...	10 PM	11 PM	74.74%	81 ms
10	NFB1 to bblde1c204-cb3500a.mitre.org...	10 PM	11 PM	74.47%	125 ms
11	MEBS to mailsrv2/129.83.221.17	10 PM	11 PM	73.28%	79.75 ms
12	MEBS to comsrv1.mitre.org/comsrv1.m...	10 PM	11 PM	72.33%	84.25 ms

Start double click on objects for more information

Trusted sites zone

CHANNEL - TOPS



```
MS-DOS Command Prompt
Microsoft(R) Windows NT(TM)
(C) Copyright 1985-1998 Microsoft Corp.

D:\WTSRU\Profiles\nfb.000>tracert softserve-nt

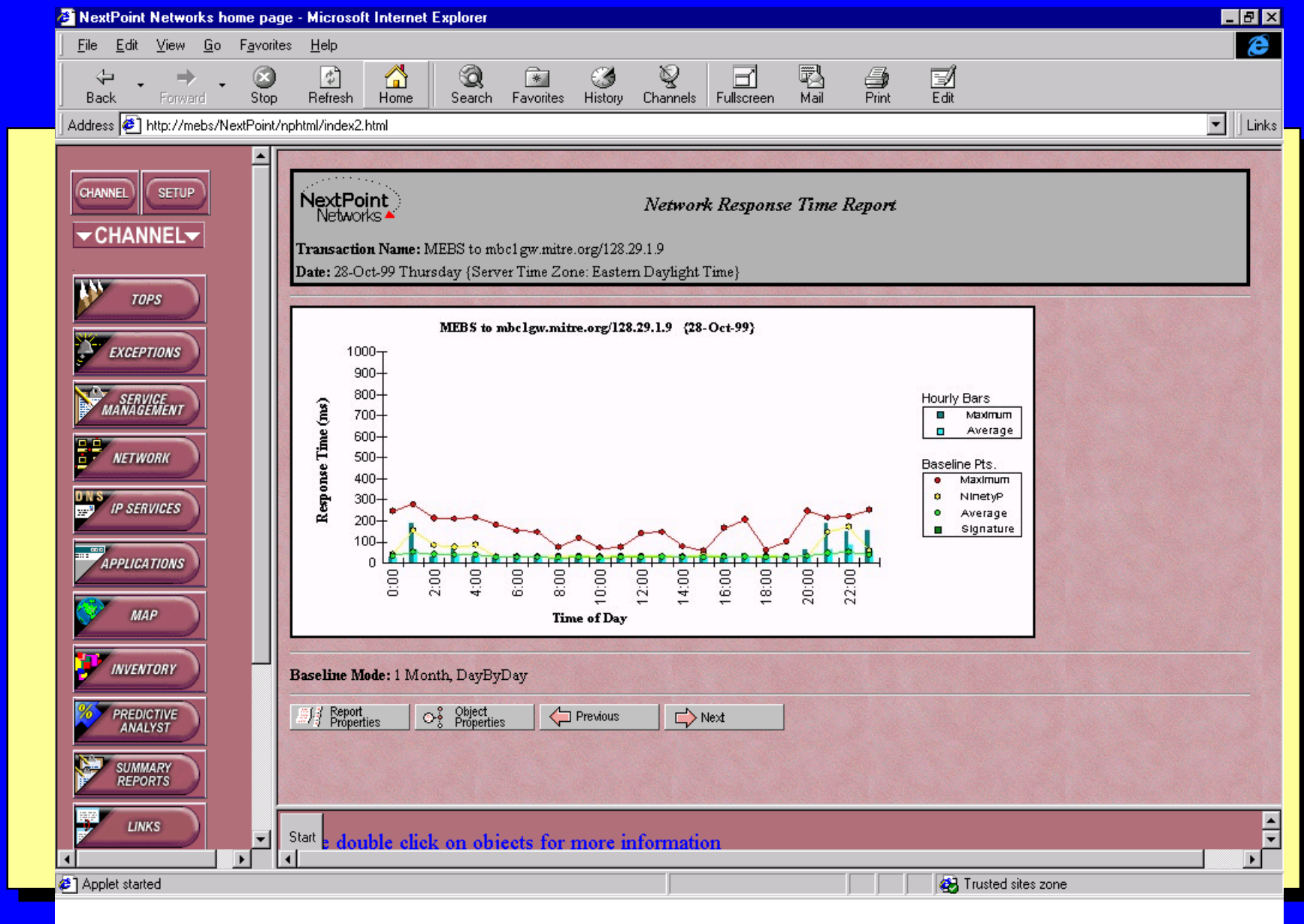
Tracing route to softserve-nt.mitre.org [129.83.29.1]
over a maximum of 30 hops:

  1  <10 ms  <10 ms  <10 ms  wrests1303-cb3500a.mitre.org [128.29.121.254]
  2  <10 ms  <10 ms  <10 ms  restgw.mitre.org [128.29.9.254]
  3  <10 ms  <10 ms  <10 ms  rest1gw.mitre.org [128.29.1.5]
  4   31 ms   31 ms   31 ms  mbc1gw.mitre.org [129.83.92.9]
  5   31 ms   31 ms   31 ms  bbldc1c204-cb3500a.mitre.org [129.83.252.70]
  6   31 ms   31 ms   47 ms  softserve-nt.mitre.org [129.83.29.1]

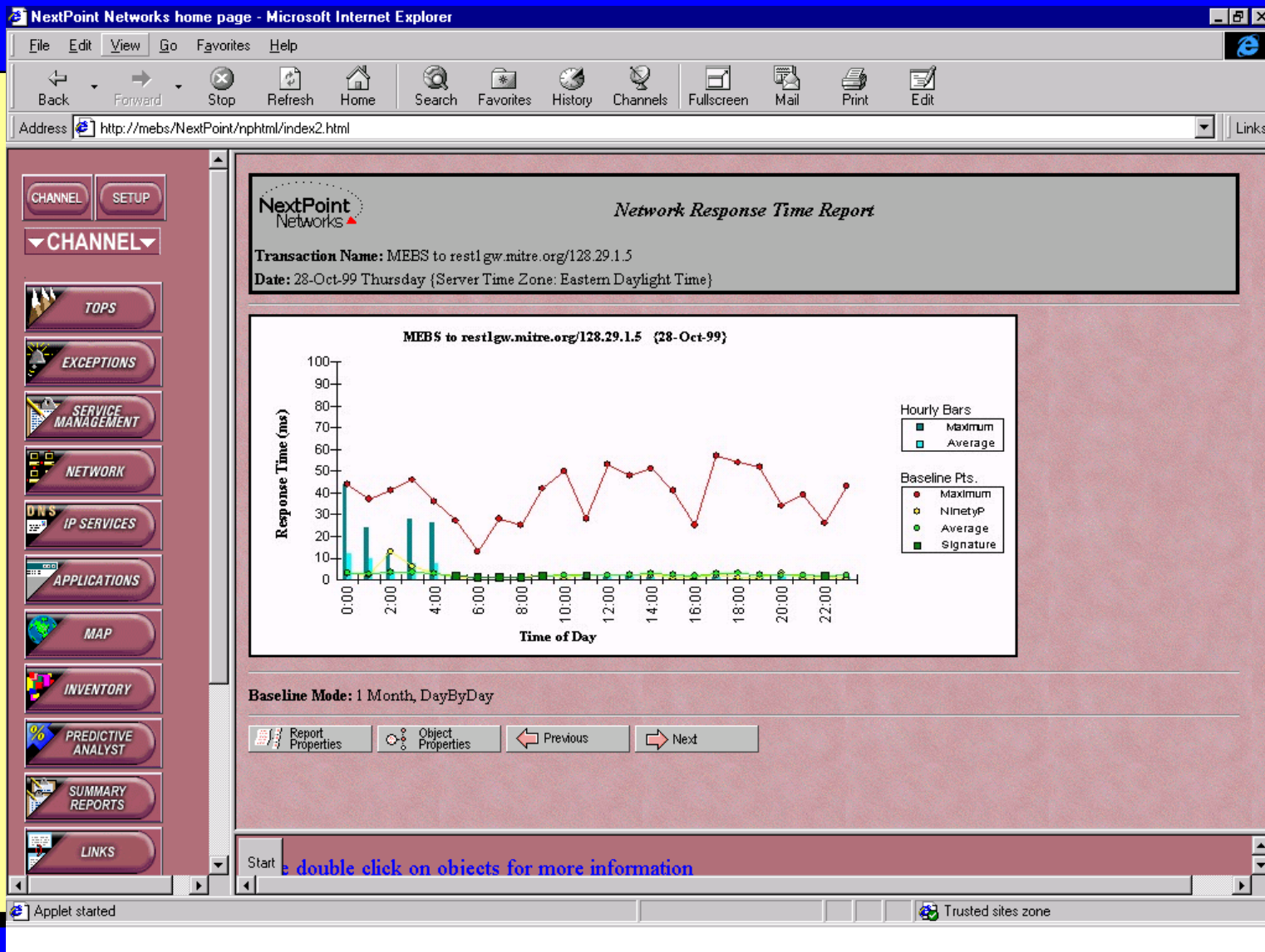
Trace complete.

D:\WTSRU\Profiles\nfb.000>_
```

CHANNEL - TOPS



CHANNEL - TOPS



CHANNEL - SERVICE LEVEL AGREEMENT

CHANNEL

SETUP

CHANNEL

TOPS

EXCEPTIONS

SERVICE MANAGEMENT

NETWORK

IP SERVICES

APPLICATIONS

MAP

INVENTORY

PREDICTIVE ANALYST

SUMMARY REPORTS

LINKS

Service Level Management

CHANNEL

Service Level Management Reports

Available Categories

Networks

Devices

Interfaces

Applications

IP Services

Response Time

Availability

Single IP Services

Source

Destination

Month

Oct., 1999

IN

W

OUT

Contract

IN

msec

vs. Contract

Better or (Worse)

MEEBS to mailsrv2.mitre.org (POP3)	MEEBS	mailsrv2.mitre.org	70%	18%	12%	98%	2000	(28.0 %)
MEEBS to mailsrv2.mitre.org (SMTP)	MEEBS	mailsrv2.mitre.org	80%	7%	12%	98%	2000	(18.0 %)
MEEBS to 128.29.154.1/mib1.mitre.org (DNS)	MEEBS	128.29.154.1	100%	0%	0%	98%	2000	2.0 %

Refresh

Generate Report

Export

Print

Help

Stop

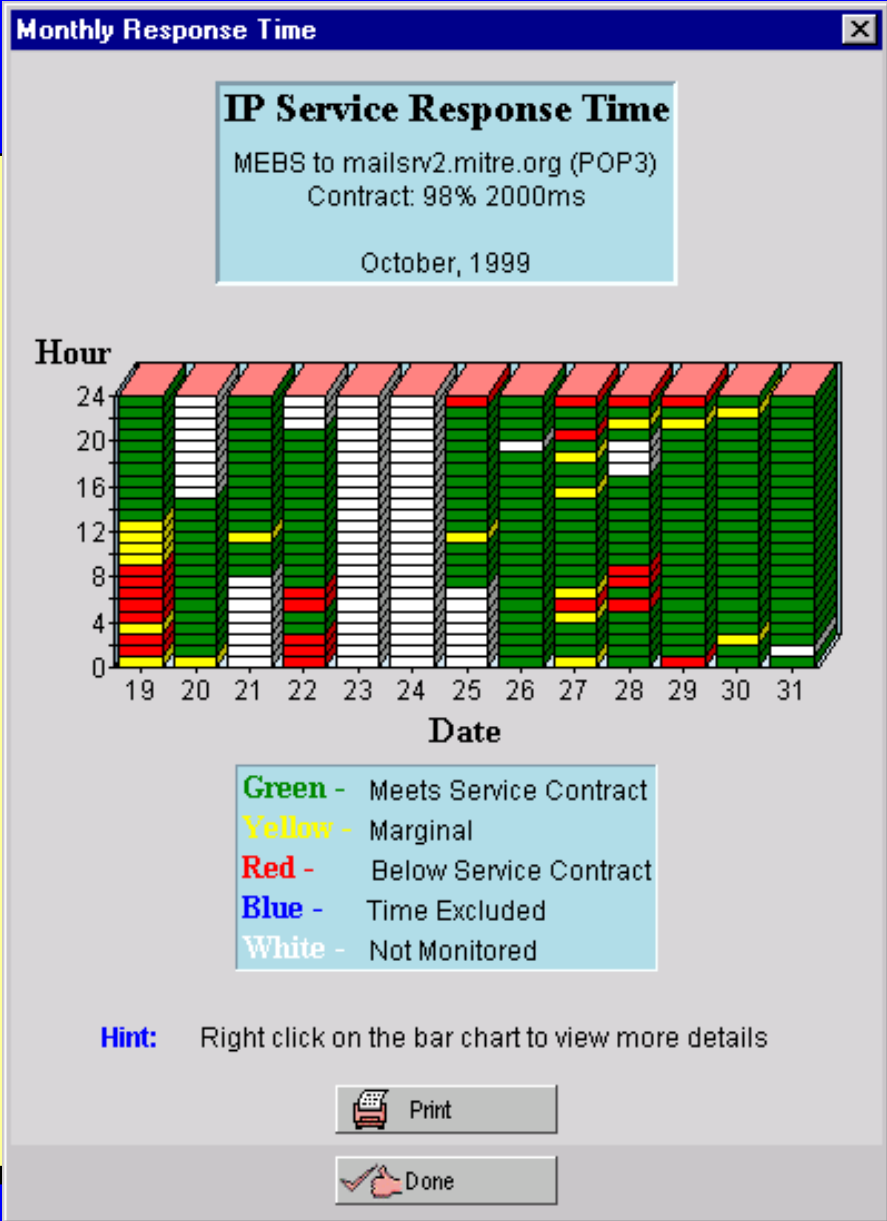
bblde1c204-cb3500a.mitre.org

Normal

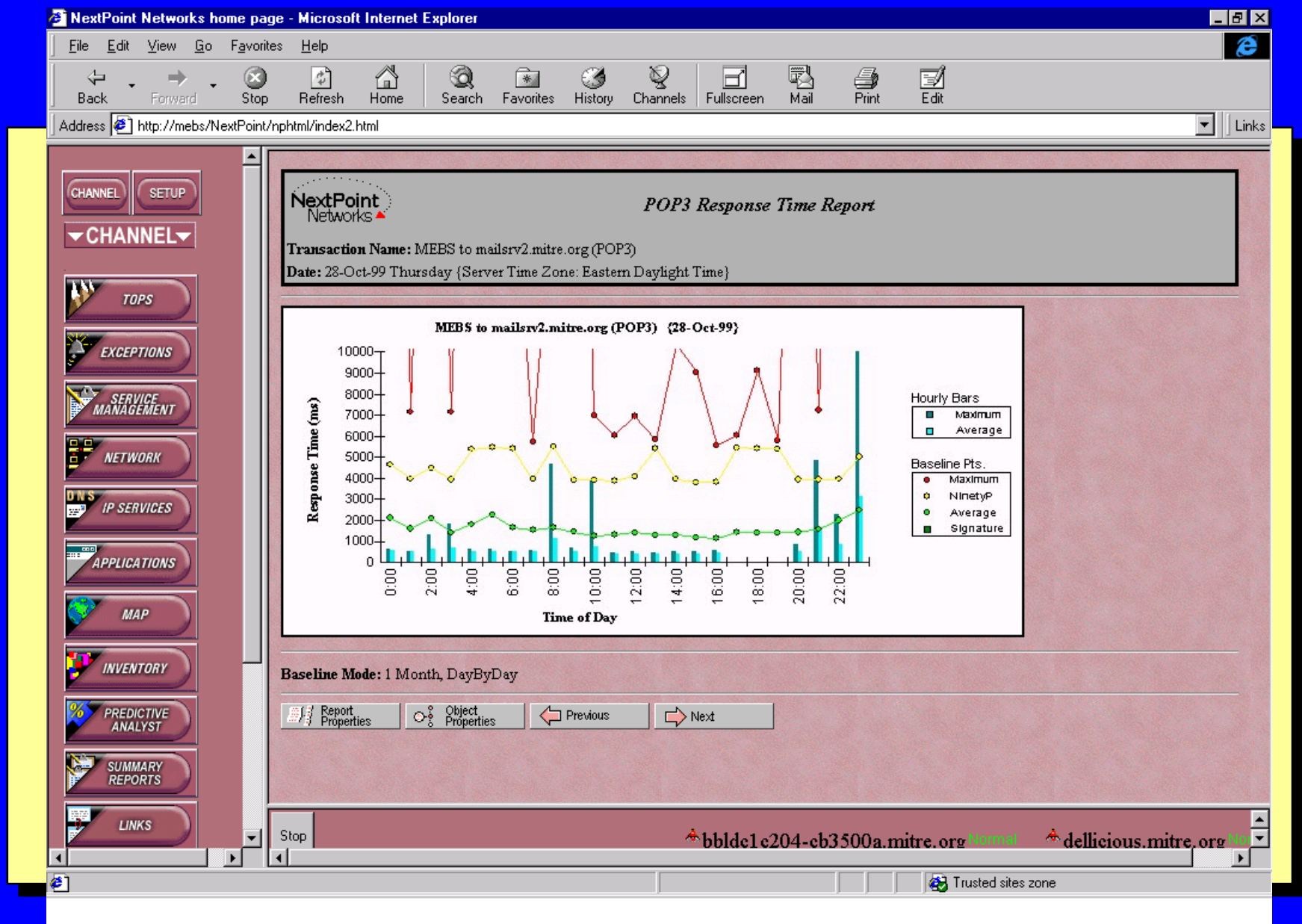
Applet started

Trusted sites zone

CHANNEL - SERVICE LEVEL AGREEMENT



CHANNEL - SERVICE LEVEL AGREEMENT

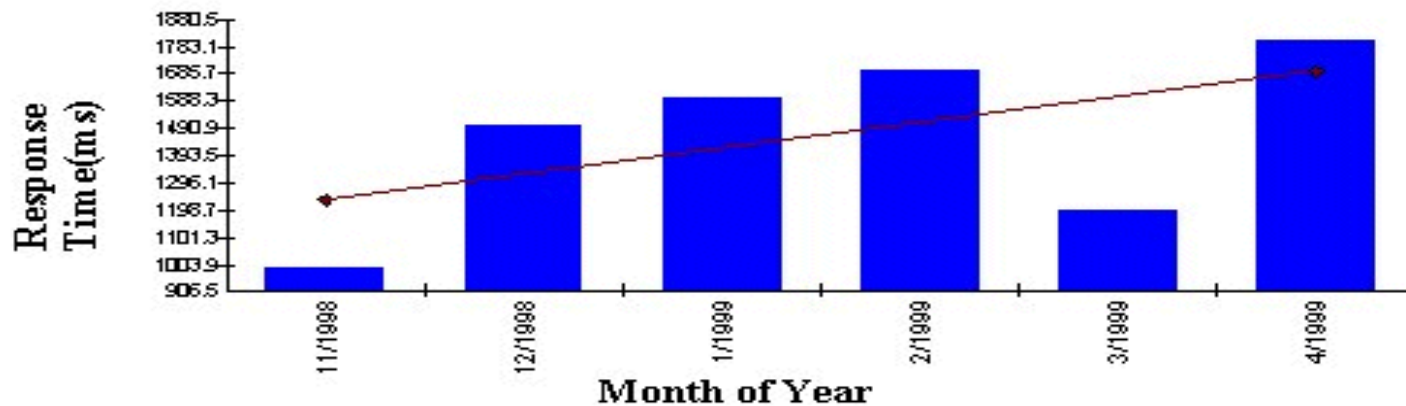


CHANNEL - SERVICE LEVEL AGREEMENT

SLM - IP service Response Time		
MEBS to mailsrv2.mitre.org Oct. 28, 1999		
Time	Status	Average (msec)
08:00 ~ 08:15		no response
08:15 ~ 08:30		609
08:30 ~ 08:45		2083
08:45 ~ 09:00		817
09:00 ~ 09:15		500
09:15 ~ 09:30		489
09:30 ~ 09:45		525
09:45 ~ 10:00		463
10:00 ~ 10:15		442
10:15 ~ 10:30		458
10:30 ~ 10:45		1599
Close		

Trend to Meet SLA

NOTE: This chart was obtained from NextPoint and is not based on actual MITRE data.



Trend analysis is based on the data between November 1998 - April 1999

Group Name	Contracted Service Level	Last Month(ms)	Trend	Months to Threshold	Next Month(ms)
Network					
NewYorkToParis	99% time	1800	Increasing	2	1788
BostonToLondon	97% time	900	Decreasing	N/A	850
Application					
ERP App	98% time	990	Decreasing	N/A	563
Database	98% time	1000	Decreasing	N/A	570

CHANNEL - NETWORK

The screenshot shows a Microsoft Internet Explorer window titled "NextPoint Networks home page - Microsoft Internet Explorer". The address bar displays "http://mebs/NextPoint/nphtml/index2.html". The browser's menu bar includes File, Edit, View, Go, Favorites, and Help. The toolbar contains buttons for Back, Forward, Stop, Refresh, Home, Search, Favorites, History, Channels, Fullscreen, Mail, Print, and Edit. The main content area has a maroon background with the word "CHANNEL" in large, stylized letters. On the left, a vertical sidebar contains buttons for CHANNEL, SETUP, and a dropdown menu labeled CHANNEL. Below these are buttons for TOPS, EXCEPTIONS, SERVICE MANAGEMENT, NETWORK, IP SERVICES, APPLICATIONS, MAP, INVENTORY, PREDICTIVE ANALYST, SUMMARY REPORTS, and LINKS. The main content area is titled "Network" and contains a section for "DAILY Network Reports" with a list of "Available Categories": Utilization, Response Time, RMON Data Link Statistics, and Frame Relay. At the bottom of the browser window, a status bar shows "Applet started" and "Trusted sites zone".

NextPoint Networks home page - Microsoft Internet Explorer

File Edit View Go Favorites Help

Back Forward Stop Refresh Home Search Favorites History Channels Fullscreen Mail Print Edit

Address <http://mebs/NextPoint/nphtml/index2.html> Links

CHANNEL SETUP

CHANNEL

TOPS

EXCEPTIONS

SERVICE MANAGEMENT

NETWORK

IP SERVICES

APPLICATIONS

MAP

INVENTORY

PREDICTIVE ANALYST

SUMMARY REPORTS

LINKS

Network

CHANNEL

DAILY Network Reports

Available Categories

- Utilization
- Response Time
- RMON Data Link Statistics
- Frame Relay

Start: double click on objects for more information

Applet started Trusted sites zone

CHANNEL - NETWORK

NextPoint Networks home page - Microsoft Internet Explorer

File Edit View Go Favorites Help

Back Forward Stop Refresh Home Search Favorites History Channels Fullscreen Mail Print Edit

Address <http://mebs/NextPoint/nphhtml/index2.html> Links

CHANNEL SETUP

CHANNEL

TOPS

EXCEPTIONS

SERVICE MANAGEMENT

NETWORK

IP SERVICES

APPLICATIONS

MAP

INVENTORY

PREDICTIVE ANALYST

SUMMARY REPORTS

LINKS

Network

CHANNEL

DAILY Network Reports

Available Categories

Utilization

Response Time

Most recent (11/23/99 Tue.)

More...

Nov., 1999

Oct., 1999

10/31/99 Sun.

10/30/99 Sat.

10/29/99 Fri.

10/28/99 Thu.

MEBS to CoreBuilder-643AE3/wrests1303-cb3500a.mitre.org

MEBS to bbldc1c204-cb3500a.mitre.org/bbldc1c204-cb3500a.mitre.org (ICMP Ping)

MEBS to corpsrv1.mitre.org/corpsrv1.mitre.org

MEBS to info2.mitre.org/info2.mitre.org

MEBS to infosrv3.mitre.org/infosrv3.mitre.org

MEBS to mailsrv2/129.83.221.17

MEBS to mbc1gw.mitre.org/128.29.1.9

MEBS to mbmgw.mitre.org/128.29.226.116

MEBS to rest1gw.mitre.org/128.29.1.5

MEBS to restgw.mitre.org/128.29.1.6

MEBS to softserve-nt.mitre.org/softserve-nt.mitre.org

NFB1 to bbldc1c204-cb3500a.mitre.org/bbldc1c204-cb3500a.mitre.org

NFB1 to corpsrv1.mitre.org/corpsrv1.mitre.org

NFB1 to mailsrv2/129.83.221.17

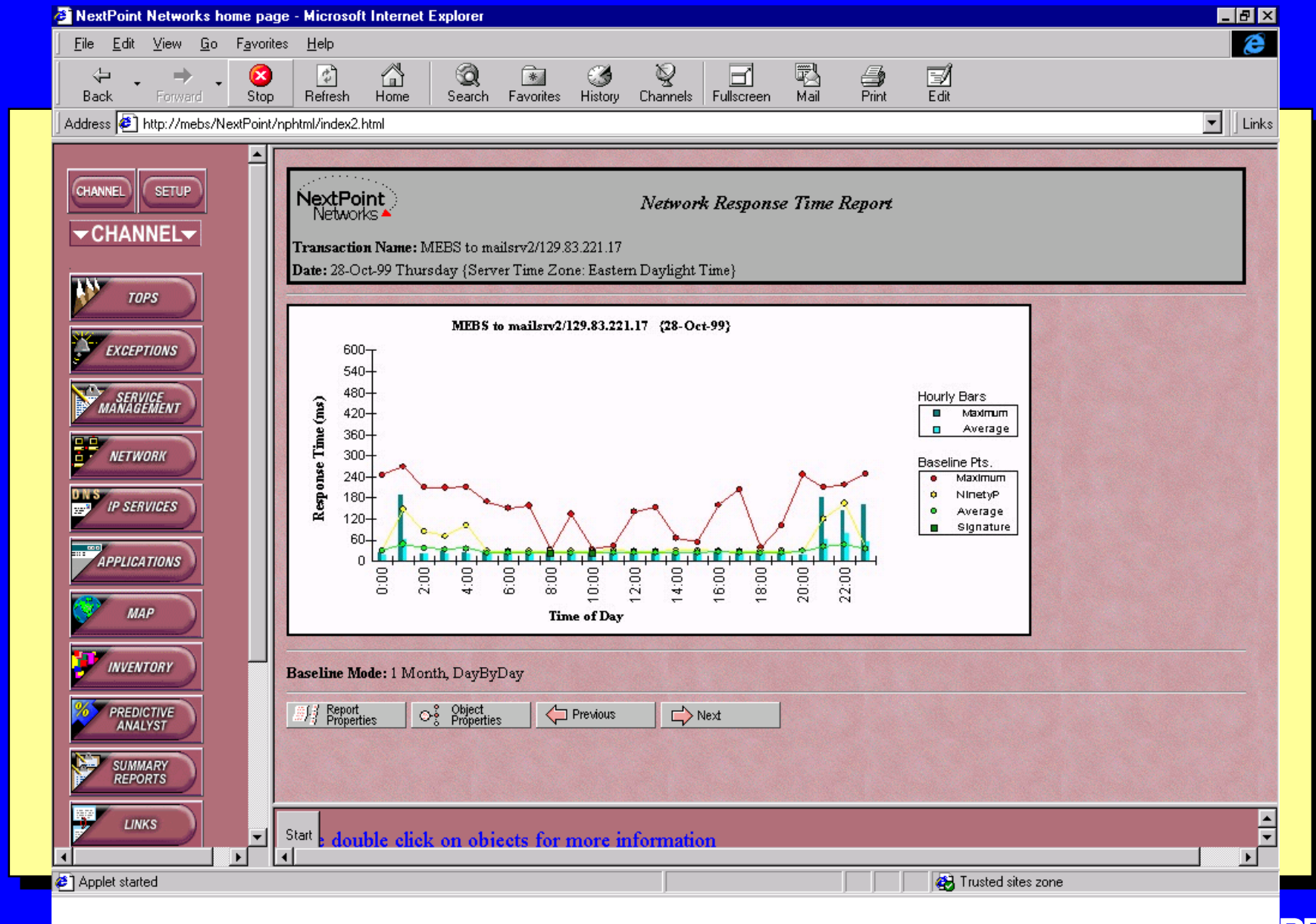
NFB1 to rest1gw.mitre.org/128.29.1.5

NFB1 to restaw.mitre.org/128.29.9.254

Start: double click on objects for more information

Done Trusted sites zone

CHANNEL - NETWORK



CHANNEL - APPLICATIONS

NextPoint Networks home page - Microsoft Internet Explorer

File Edit View Go Favorites Help

Back Forward Stop Refresh Home Search Favorites History Channels Fullscreen Mail Print Edit

Address <http://mebs/NextPoint/nhtml/index2.html> Links

CHANNEL SETUP

CHANNEL

TOPS

EXCEPTIONS

SERVICE MANAGEMENT

NETWORK

IP SERVICES

APPLICATIONS

MAP

INVENTORY

PREDICTIVE ANALYST

SUMMARY REPORTS

LINKS

Applications

CHANNEL

Daily Traffic Analysis

Application Monitoring Reports

- Available Categories
 - Response Time
 - DB
 - TCP
 - WEB
 - Most recent (11/23/99 Tue.)
 - More...
 - e-Commerce
 - Most recent (11/23/99 Tue.)
 - More...
 - Nov., 1999
 - Oct., 1999
 - User Plug-In
 - ARM
 - Utilization
 - RMON

Start double click on objects for more information

Applet started Trusted sites zone

CHANNEL - APPLICATIONS

NextPoint Networks home page - Microsoft Internet Explorer

File Edit View Go Favorites Help

Back Forward Stop Refresh Home Search Favorites History Channels Fullscreen Mail Print Edit

Address <http://mebs/NextPoint/nphtml/index2.html> Links

CHANNEL SETUP

▼ CHANNEL ▼

TOPS

EXCEPTIONS

SERVICE MANAGEMENT

NETWORK

IP SERVICES

APPLICATIONS

MAP

INVENTORY

PREDICTIVE ANALYST

SUMMARY REPORTS

LINKS

Applications

CHANNEL

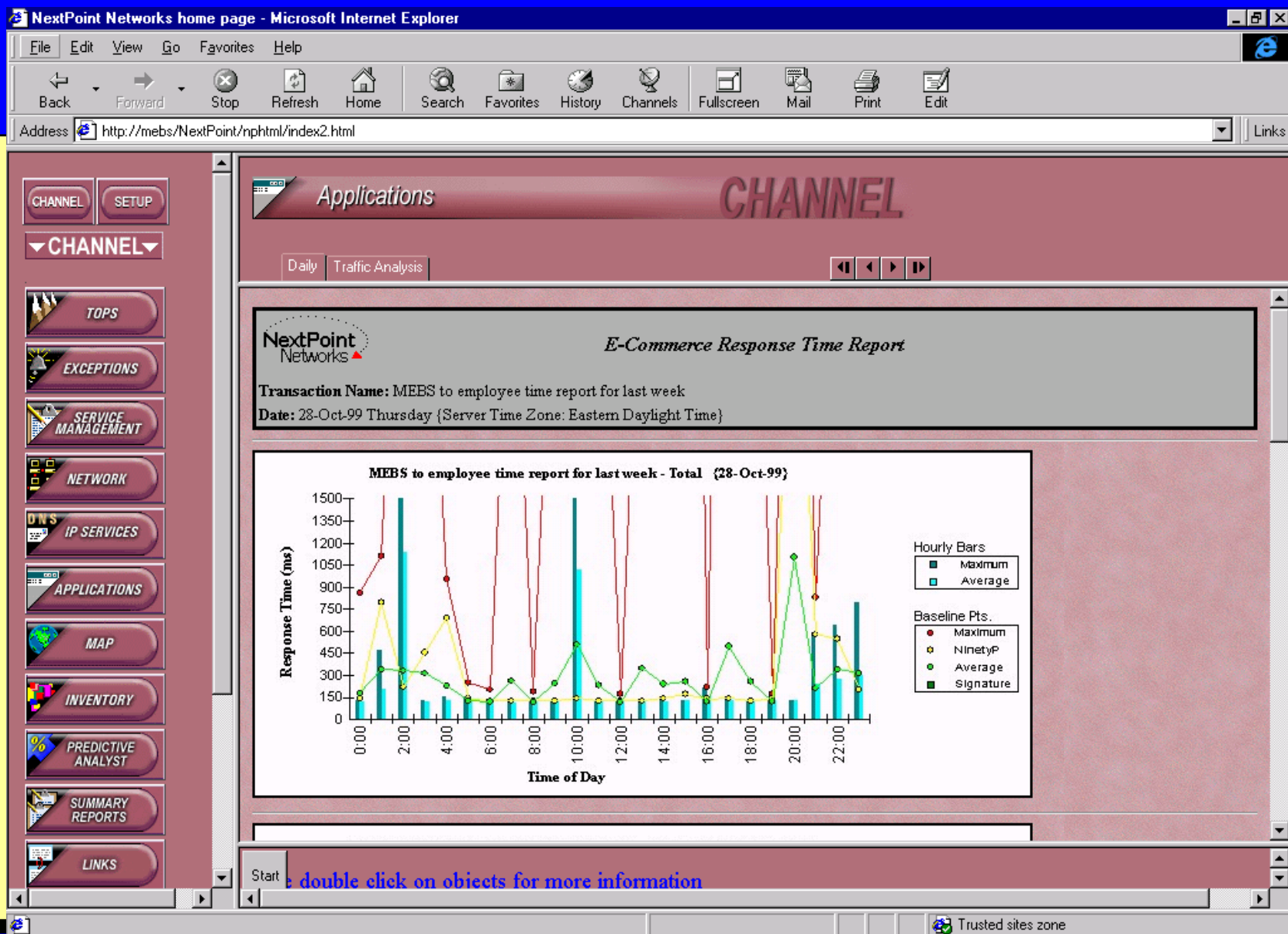
Daily Traffic Analysis

Application Monitoring Reports

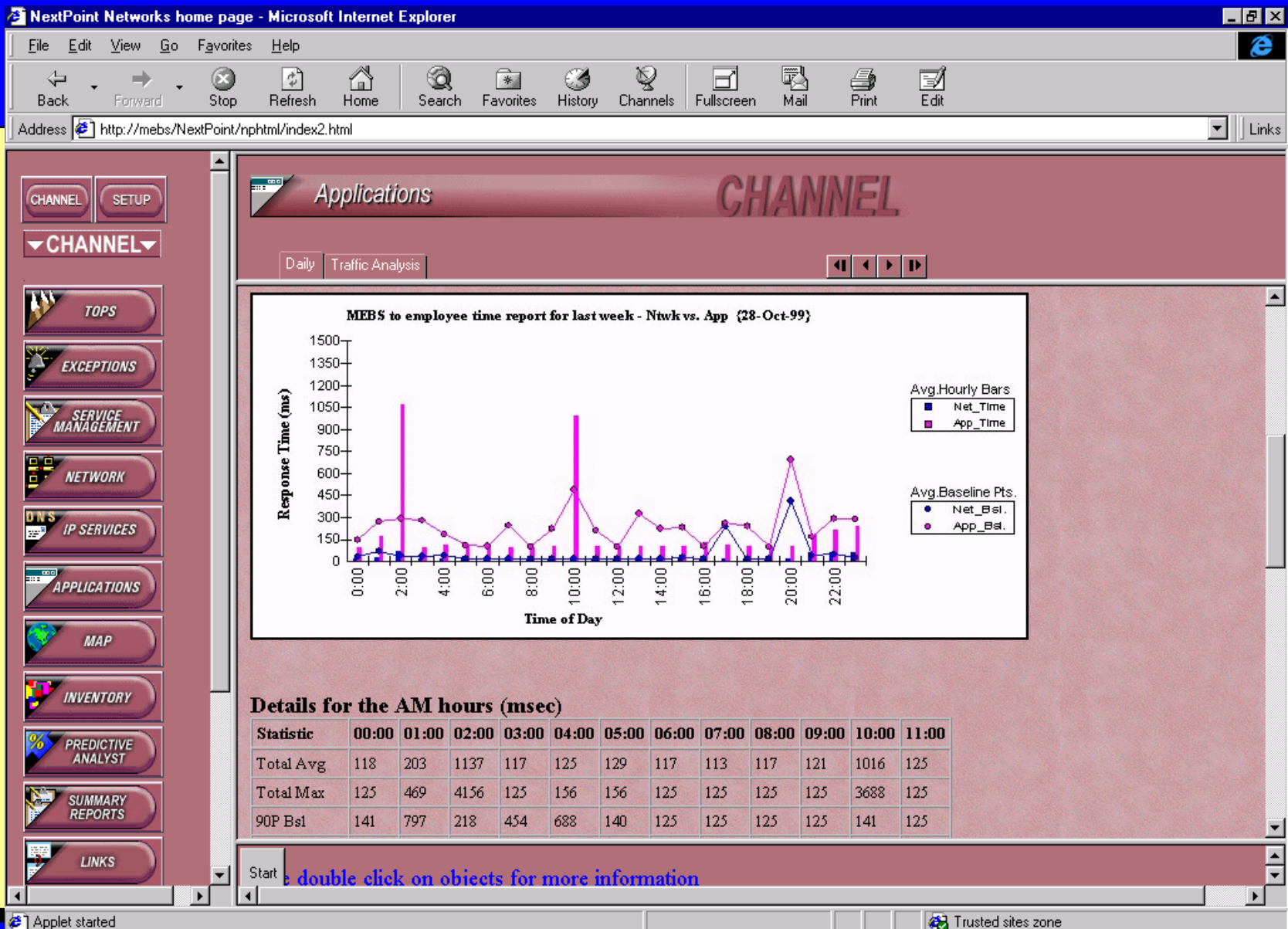
- DB
 - TCP
 - WEB
 - Most recent (11/23/99 Tue.)
 - More...
 - e-Commerce
 - Most recent (11/23/99 Tue.)
 - More...
 - Nov., 1999
 - Oct., 1999
 - 10/31/99 Sun.
 - 10/30/99 Sat.
 - 10/29/99 Fri.
 - 10/28/99 Thu.
 - MEBS to employee time report for last week
 - MEBS to info.mitre.org - Phone Directory Lookup
 - NFB1 to employee time report for last week
 - NFB1 to info.mitre.org - Phone directory lookup
 - 10/27/99 Wed.
 - 10/26/99 Tue.
 - 10/25/99 Mon.
 - 10/22/99 Fri.
 - 10/21/99 Thu.
 - 10/20/99 Wed.
 - 10/19/99 Tue.

Start double click on objects for more information

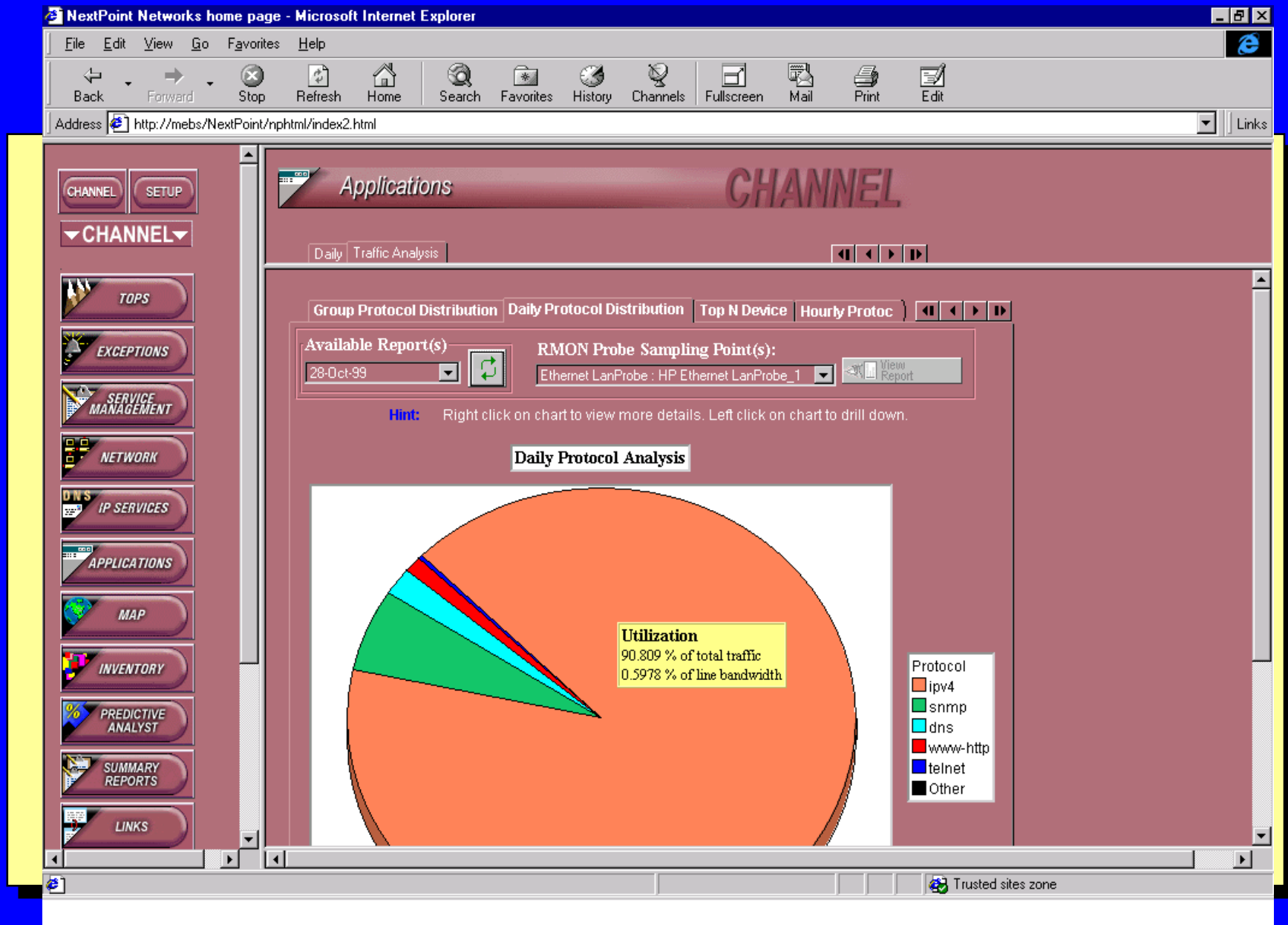
CHANNEL - APPLICATIONS



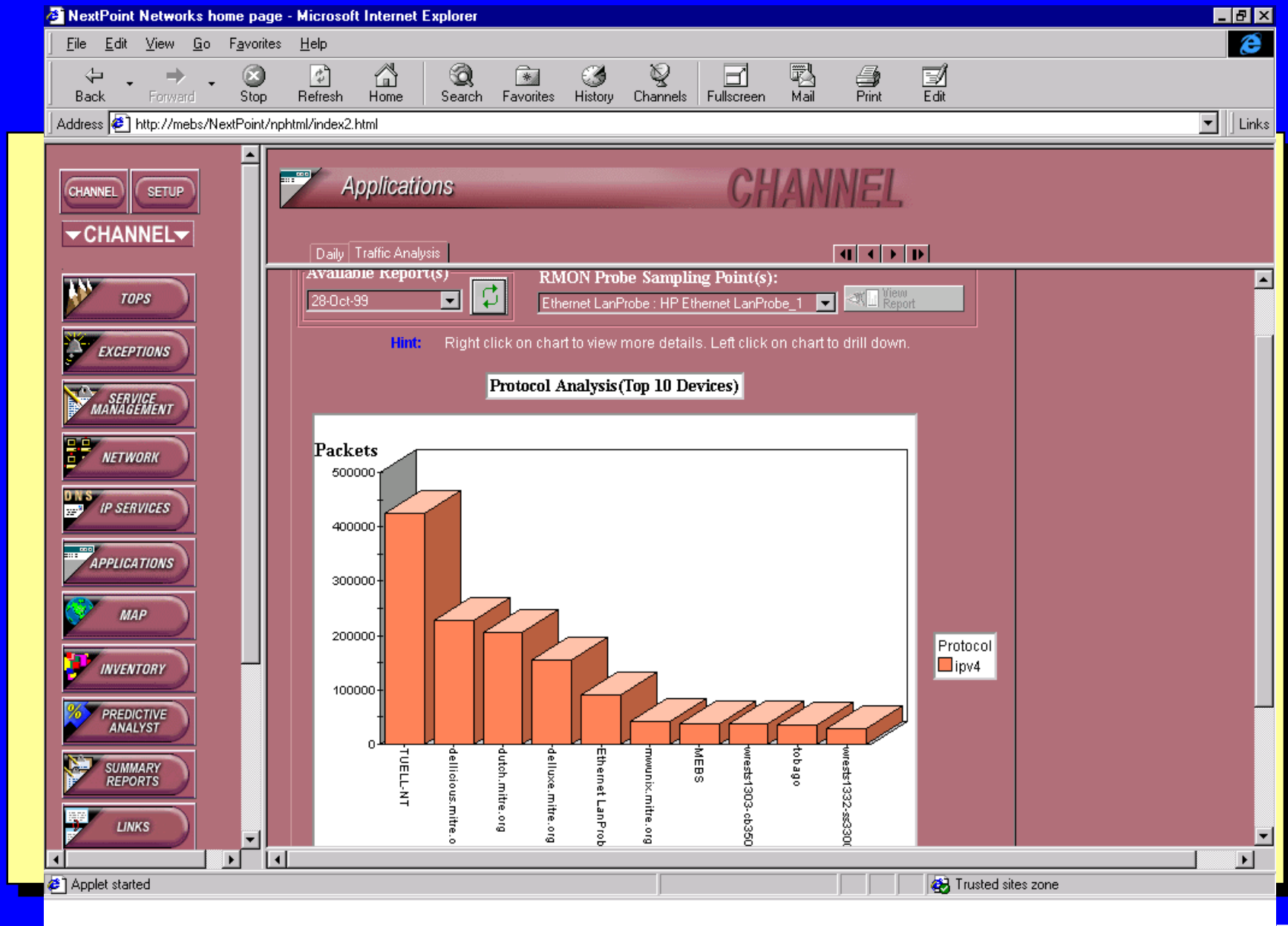
CHANNEL - APPLICATIONS



CHANNEL - APPLICATIONS - RMON



CHANNEL - APPLICATIONS - RMON



Backup

Application Monitoring Products Potential Components

- **The following are available with S³ unless otherwise noted**
- **Pro-Active Agents**
 - **Perhaps one per significant LAN**
 - **Uses synthetic application transactions**
 - **Specialized modules**
 - **Frame relay, RMON, others**
- **Real time events**
 - **Interface to trouble ticketing via network management**
- **Network monitoring**
 - **SNMP base**
 - **Network discovery - layers 2 and 3**
 - **Uses RMON2 statistics**

Application Monitoring Products Potential Components - Concluded

- **Miscellaneous**

- **Web-based console**
- **Long-term data storage**
- **Monitor service level agreements**
- **Report generation**
- **Application & Network correlation**
- **Trend analysis**
- **Predictive Analysis**

- **Passive agents [Not available with S³]**

- **One per desktop or workstation**
- **Monitors all**
 - **Potential for content monitoring**

Alternatives in Application Performance Management / Monitoring

- **End-to-End pro-active agent-based**
 - Uses synthetic application transactions
 - Example - NextPoint's S³
- **End-to-End passive agent-based**
 - Monitor keystrokes of desktops
 - Example - Lucent's VitalSuites
- **Application instrumentation**
 - AIC standards-based
 - ARM standards-based
 - SNMP host MIB-based. Extensible SNMP agents
 - Standard MIB and proprietary MIBs
 - Example - Concord's Empire MIB product

Alternatives in Application Performance Management / Monitoring

- **Network-gathered statistics-oriented RMON MIB**
 - Standards based
 - Examples - HP's NetMetrix, Network Associates' Distributed Sniffer, NetScout
 - Extensions currently being investigated for Applications
 - IETF working group
 - Addition of application response time statistics
- **Monitoring of application server**
 - Via:
 - OS of application server
 - element management systems
 - other management platform
 - Often proprietary interfaces
 - Examples - BMC's Best/1, Concord Network Health

S³ List prices

Volume discounts not applied

- **S³ Server Software - \$12,000**
 - All SNMP info for LAN/WAN
- **Functional modules - \$7,000 each**
 - Application
 - Allows response times for specific apps
 - Traffic Module
 - Frame Relay
 - Service Level
 - Predictive Analysis
- **Monitored interfaces (“elements”)**
 - Every port that you want to monitor on the network - switches and routers and servers
 - \$50 each
- **Agents - \$500 each**
- **Maintenance - 18%**

S3 List prices

Volume discounts not applied

(Concluded)

- **Bundled package - \$27,900**
 - **S3 Server**
 - **Application module**
 - **5 agents**
 - **50 elements**
 - **Service-level manager module**

Examples of Decision Criteria Application Performance Monitoring

- **Cost**
- **Platforms that the management software and agents can reside on**
- **Standard functions available**
 - **Passive distributed agents**
 - **Pro-active distributed agents**
 - **Events / Real-time trouble reporting**
 - **Network monitoring component. SNMP-based. RMON-based**
 - **Report generation. Trend analysis. Long-term data storage. Predictive analysis**
- **Ability to hierarchically organize management platforms**
- **Ability to use a distributed database**

Examples of Decision Criteria

App. Performance Monitoring -

Concluded

- **Have an API**
- **Ability to be configured from OpenView in a graphically-based manner**
- **Modeling capability**
- **Ability to update and configure agents remotely**
- **Availability of various agent types**
 - **ATM, Frame Relay, etc.**
- **Software bugs**
- **Web-based interface**
- **Set of applications that can natively monitor**
- **Ability to incorporate a user's customized application query**
- **Ease of external access to database**